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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09 782,446	02 12 2001	Chok W. Ho	LAM1P152 P0692	9868

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EXAMINER

VINH, LAN

ART UNIT	PAPER NUMBER
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1765

DATE MAILED: 11 18 2002

Please find below and/or attached an Office communication concerning this application or proceeding.

# Office Action Summary

Application No.

09/782.446

Examiner

Lan Vinh

Applicant(s)

HO ET AL

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

## Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

## Status

- 1) ☒ Responsive to communication(s) filed on 12 February 2001.
- 2a) ☐ This action is FINAL.
- 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

## Disposition of Claims

- 4) ☒ Claim(s) 1-19 is/are pending in the application.
- 4a) Of the above claim(s) 17-19 is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-16 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

## Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on \_\_\_\_\_ is: a) ☐ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

## Priority under 35 U.S.C. §§ 119 and 120

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- \* See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

## Attachment(s)

- 1) ☐ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s) 4, 5

- 4) ☐ Interview Summary (PTO 413) Paper No(s) \_\_\_\_\_
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other

**DETAILED ACTION**

***Election/Restrictions***

1. Restriction to one of the following inventions is required under 35 U.S.C. 121:
  - I. Claims 1-16, drawn to a method of plasma etching, classified in class 438, subclass 706.
  - II. Claims 17-19, drawn to an integrated circuit/product, classified in class 257, subclass 513.
2. The inventions are distinct, each from the other because of the following reasons:

Inventions I and II are related as process of making and product made. The inventions are distinct if either or both of the following can be shown: (1) that the process as claimed can be used to make other and materially different product or (2) that the product as claimed can be made by another and materially different process (MPEP § 806.05(f)). In the instant case the integrated circuit/product as claimed can be made by another and materially different process such as a wet etching process.
3. Because these inventions are distinct for the reasons given above and have acquired a separate status in the art as shown by their different classification, restriction for examination purposes as indicated is proper.
4. Because these inventions are distinct for the reasons given above and the search required for Group I is not required for Group II, restriction for examination purposes as indicated is proper.
5. During a telephone conversation with Michael Lee on 11/12/2002 a provisional election was made with traverse to prosecute the invention of Group I, claims 1-16.

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Affirmation of this election must be made by applicant in replying to this Office action.

Claims 17-19 are withdrawn from further consideration by the examiner, 37

CFR 1.142(b), as being drawn to a non-elected invention.

6. Applicant is reminded that upon the cancellation of claims to a non-elected invention, the inventorship must be amended in compliance with 37 CFR 1.48(b) if one or more of the currently named inventors is no longer an inventor of at least one claim remaining in the application. Any amendment of inventorship must be accompanied by a request under 37 CFR 1.48(b) and by the fee required under 37 CFR 1.17(l)

### ***Specification***

7. The applicants are requested to provide the US patent application numbers listed under the related applications section on page 1 of the specification.

### ***Claim Rejections - 35 USC § 102***

8. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in a patent granted on an application for patent by another filed in the United States before the invention thereof by the applicant for patent, or on an international application by another who has fulfilled the requirements of paragraphs (1), (2), and (4) of section 371(c) of this title before the invention thereof by the applicant for patent.

9. The changes made to 35 U.S.C. 102(e) by the American Inventors Protection Act of 1999 (AIPA) do not apply to the examination of this application as the application being examined was not (1) filed on or after November 29, 2000, or (2) voluntarily published

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under 35 U.S.C. 122(b). Therefore, this application is examined under 35 U.S.C. 102(e) prior to the amendment by the AIPA (pre-AIPA 35 U.S.C. 102(e)).

10. Claims 1-4, 12, 13, 16 are rejected under 35 U.S.C. 102(e) as being anticipated by Ye et al (US 6,080,529 )

Ye discloses a method of etching patterned dielectric layer. This method comprises the steps of:

placing a substrate having an organic low k dielectric layer 404 (polyarylene) formed thereon in an etching chamber (col 21, lines 50-63)

using a plasma source gas of  $\text{NH}_3$  inherently provided into the etching chamber to generate a plasma to etch the organic low k dielectric layer 404 (col 22, lines 39-42 )

Regarding claim 2, Ye discloses using a flow rate of 70 sccm of  $\text{NH}_3$  (col 22, lines 42) which overlaps the claimed range of 5 sccm to 1500 sccm

Regarding claims 3, 12, Ye discloses the step of forming a hard mask layer 402 over the the layer 404 (col 21, lines 43-45)

Regarding claims 4, 13, Ye discloses the step of forming a patterned photoresist layer over the hard mask layer 402 (col 22, lines 1-3); the  $\text{NH}_3$  plasma etches the organic layer and remove/strip the photoresist layer (col 22, lines 38-42 )

Regarding claim 16, Ye discloses that the organic low k dielectric material 14 is made of polyarylene/ organic low k material (col 6, lines 25-2

***Claim Rejections - 35 USC § 103***

11. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

12. Claims 5-7, 14-15 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ye et al (US 6,080,529 ) in view of Ding et al (US 5,814,563)

Ye method has been described above in paragraph 10. Unlike the instant claimed invention as per claims 5, 6, 14, Ye fails to disclose providing CH<sub>3</sub>F gas ( flow rate between 1 sccm -50 sccm ) while providing NH<sub>3</sub> into the chamber to etch the dielectric layer.

However, Ding, in a method for etching dielectric layer using fluorocarbons, teaches flowing CH<sub>3</sub>F gas ( flow rate between 5 sccm-20 sccm ) and NH<sub>3</sub> gas into the chamber to etch the dielectric layer (col 10. lines 26-27 )

Hence, one skilled in the art would have found it obvious to modify Ye's step of etching the dielectric layer by using an etching mixture of CH<sub>3</sub>F gas and NH<sub>3</sub> to etch the dielectric layer as per Ding because Ding teaches that it has been discovered that fluorohydrocarbons gas in combination with NH<sub>3</sub>-generation gas provides unexpected and surprising results such as providing increased dielectric etch rate (col 6, lines 14-18)

Regarding claims 7, 15, Ye discloses performing an etch with  $\text{CF}_4$  gas to etch the hard mask layer before etching the dielectric layer 404 (col 22, lines 1-5)

13. Claims 8-10, 11 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ye et al (US 6,080,529 ) in view of Ding et al (US 5,814,563) and further in view of Ikegami (US 6,355,572)

Ye as modified by Ding has been described above in paragraph 11. Unlike the instant claimed inventions as per claims 8, 9, Ye and Ding fail to disclose using  $\text{C}_4\text{F}_8$  gas and oxygen gas in addition with the etchant gas comprising  $\text{CF}_4$

However, Ikegami discloses a method for dry etching an organic SOG/dielectric film comprises the step of etching a dielectric layer using  $\text{C}_4\text{F}_8 + \text{O}_2$  in addition to  $\text{CF}_4$  etchant (col 3, lines 36-46 )

Hence, one skilled in the art would have found it obvious to modify Ye and Ding by adding  $\text{C}_4\text{F}_8 + \text{O}_2$  gaseous mixture to the  $\text{CF}_4$  etchant as per Ikegami because Ikegami states that the addition of oxygen is considered to be a phenomenon peculiar to the organic dielectric layer and indicates that the oxygen gas other than the  $\text{C}_4\text{F}_8$  gas is useful as etching species of the organic dielectric film (col 4, lines 47-50 )

Regarding claim 10, Ye as modified by Ding and Ikegami disclose the invention except for the specific flow rate of oxygen. However, it would have been obvious to one having ordinary skill in the art at the time the invention was made to adjust the flow rate of oxygen in Ye's modified method to obtain any specific value, since it has been held

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that discovering an optimum value of a result effective variable involves only routine skill in the art. *In re Boesch*, 617 F. 2d 272, 205 USPQ 215 (CCPA 1980 )

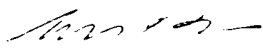
The limitation of claim 11 has been discussed above in paragraph 10.

### ***Conclusion***

14. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Lan Vinh whose telephone number is 703 305-6302. The examiner can normally be reached on M-F 8:30-5:30 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Benjamin Utech can be reached on 703 308-3836. The fax phone numbers for the organization where this application or proceeding is assigned are 703 872-9310 for regular communications and 703 872-9311 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703 308-0661.

  
BENJAMIN L. UTECH  
SUPERVISORY PATENT EXAMINER  
TECHNOLOGY CENTER 1700

LV  
November 13, 2002